Ego-network Approach to Global Politico-economic Networks

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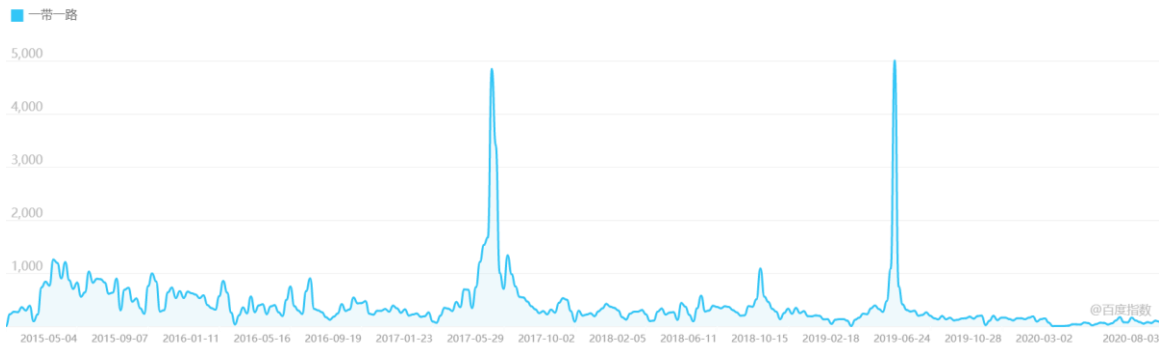
Original Research Plan

- Purpose
  - Characterizing the network structure and evolution of the Belt-Road Initiative (BRI)
  - Evaluating Hong Kong's bridging role in BRI
  - Exploring new opportunities for Hong Kong in BRI
  - etc.
- Data:
  - Global trade network, 2009-2019
  - Global capital network, 2009-2018
  - Global news network, 2009-2019
- Method:
  - Structural characteristics of the global networks
  - Behavioral cartelistic of the key actors (e.g., mainland China, Hong Kong, etc.)

Key Metrics of Global Politico-Economic Networks

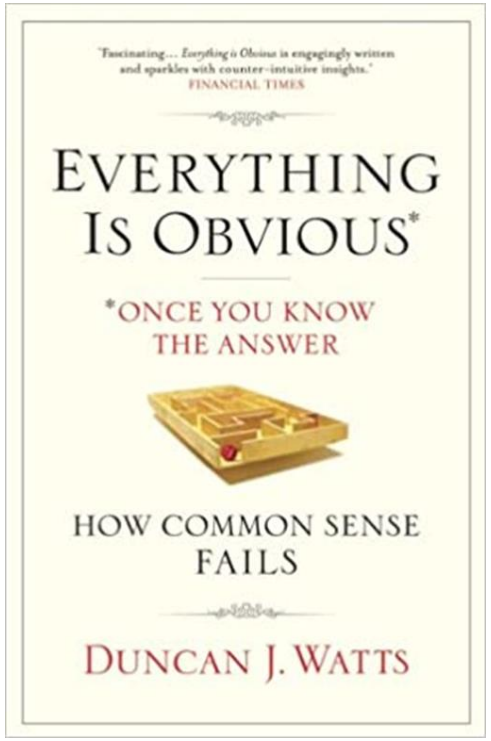
Data World vs. Real World

- Data World
  - The networks are well connected
  - The networks continuously grow
  - The networks behave normally
    - Small-world (highly clustering, short path length, etc.)
    - Scale-free (power-law distribution, preferential attachment, etc.)
    - etc.
- Real World
  - Brexit
  - U.S.-Sino trade war
  - BRI in lowkey
  - etc.

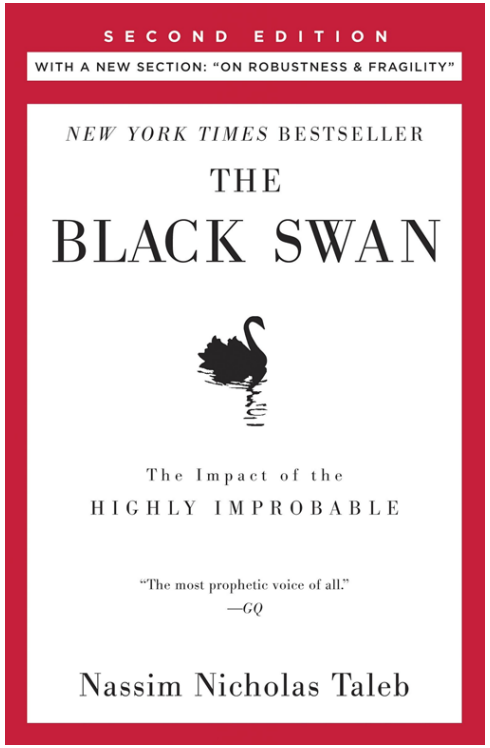


What's the Problem

- Confirmed "known knowns"
- So what?

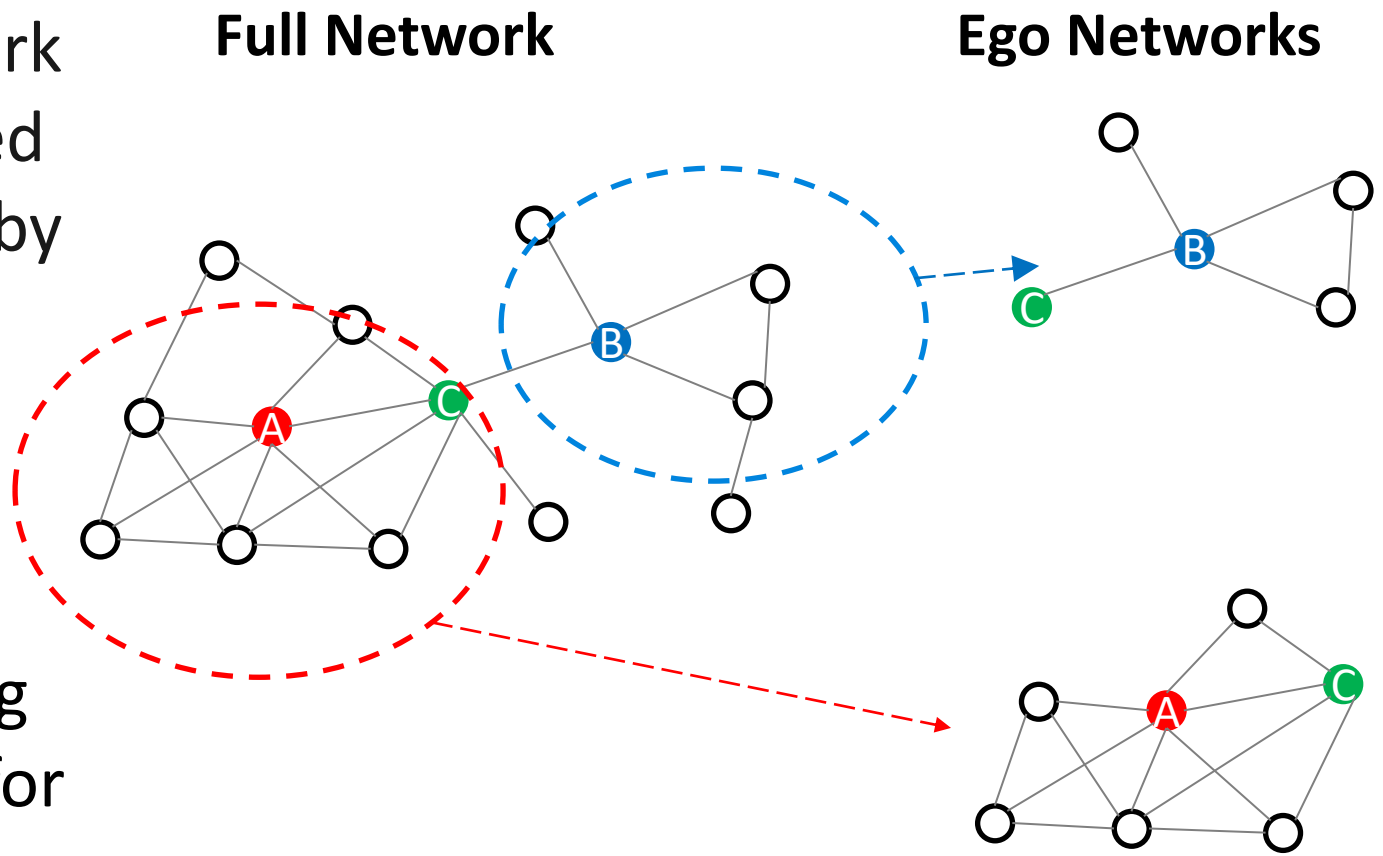


- Can't explain "known unknowns"
- Can't predict "unknown unknowns"



Let's Try the Ego Network Approach

- The egocentric (or ego) network of vertex v in graph G is defined as the subgraph of G induced by v (ego) and its neighbors (alters).
- Ego network provides a quite different perspective from the full network on the embedding structure and respective role for each node.



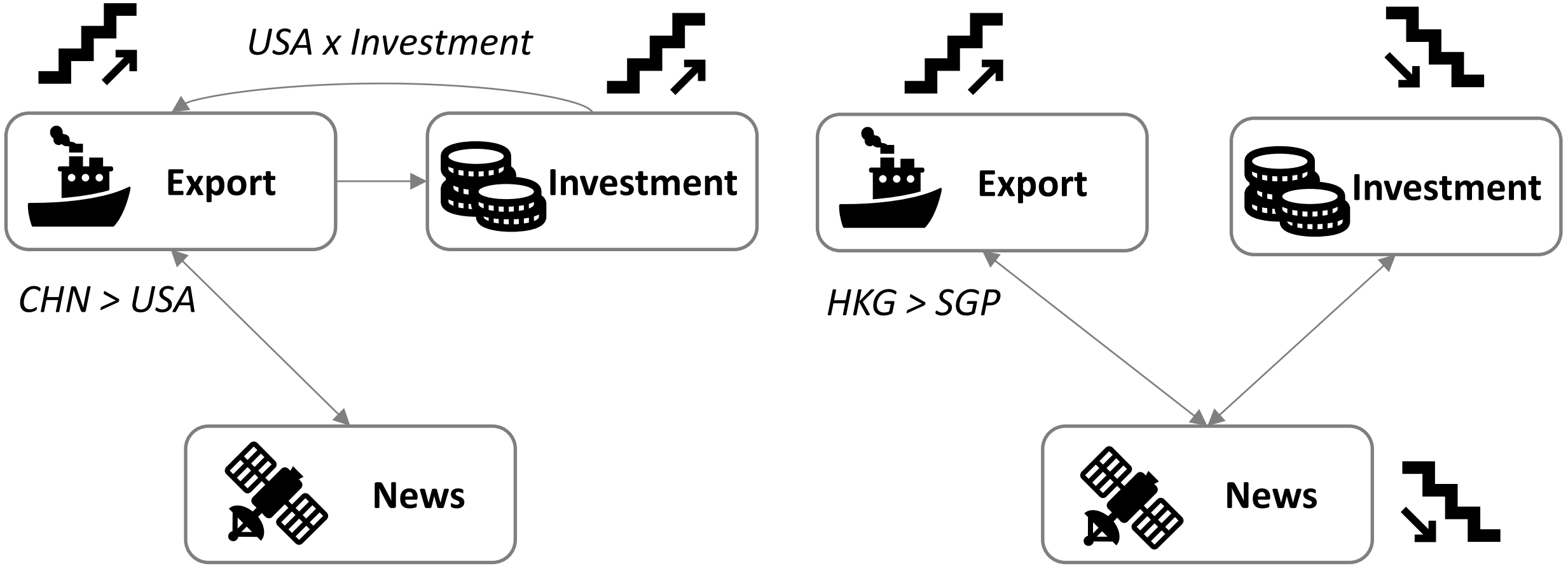
What Are We Cooking

- Focusing on selected ego networks (USA, CHN, HKG, SGP)
- Pairing the ego networks (USA vs. CHN, HKG vs. SGP)
- Integrating flows of goods (G), money (M) and news (E) into one model

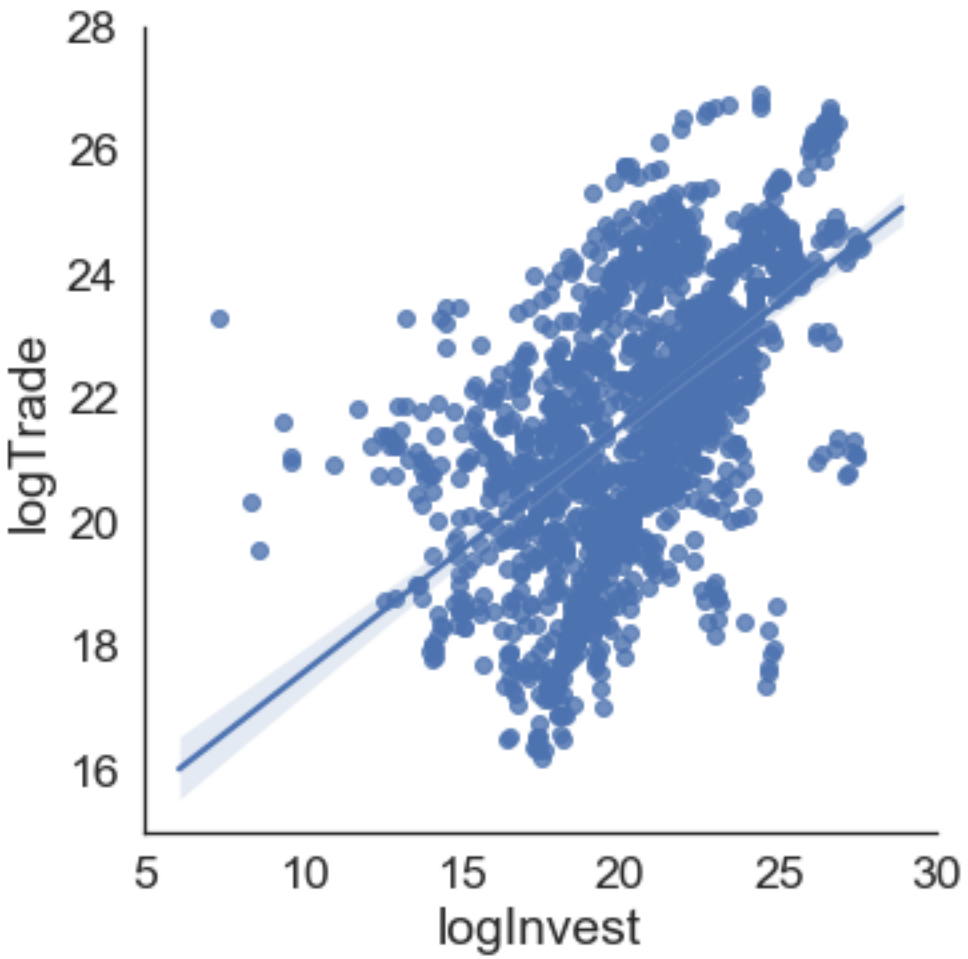
$$\begin{cases} G_{ijt} = \beta_{ij}T_t + \beta_{ij}G_{ijt-1} + \beta_{ijt}M_{ijt-1} + \beta_{ijt}N_{ijt-1} + \sum_{i=1}^{k}\gamma_i \mathrm{C}_{it} + \sum_{i=1}^{k}\gamma_j \boldsymbol{C}_{jt} + u_{ij} + v_j + e_{ijt} \\ M_{ijt} = \beta_{ij}T_t + \beta_{ij}G_{ijt-1} + \beta_{ijt}M_{ijt-1} + \beta_{ijt}N_{ijt-1} + \sum_{i=1}^{k}\gamma_i \boldsymbol{C}_{it} + \sum_{i=1}^{k}\gamma_j \boldsymbol{C}_{jt} + u_{ij} + v_j + e_{ijt} \\ N_{ijt} = \beta_{ij}T_t + \beta_{ij}G_{ijt-1} + \beta_{ijt}M_{ijt-1} + \beta_{ijt}N_{ijt-1} + \sum_{i=1}^{k}\gamma_i \boldsymbol{C}_{it} + \sum_{i=1}^{k}\gamma_j \boldsymbol{C}_{jt} + u_{ij} + v_j + e_{ijt} \end{cases}$$

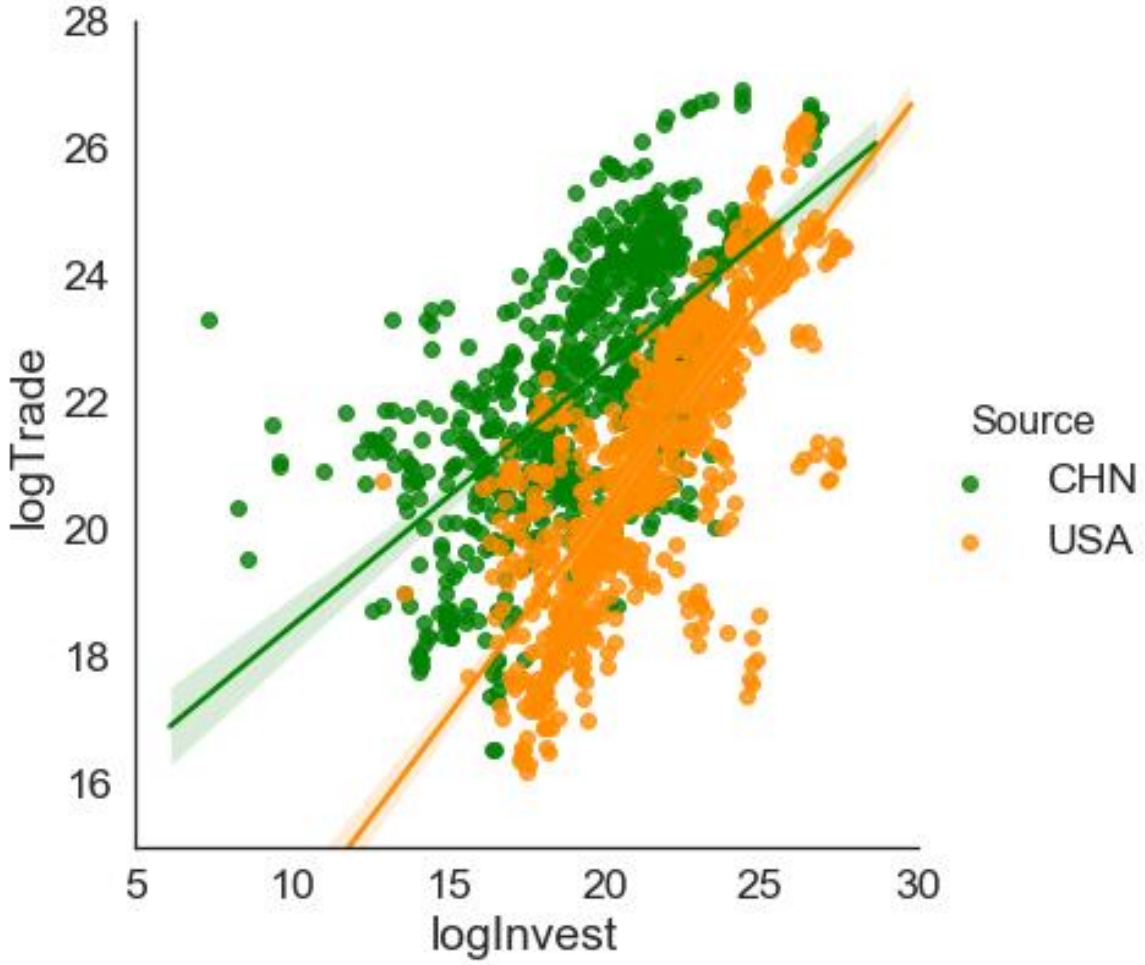
where T = time factor, C = vector of controls (population size, GPD, etcj.), $i \neq j$

Preliminary Results from the Integrated Model

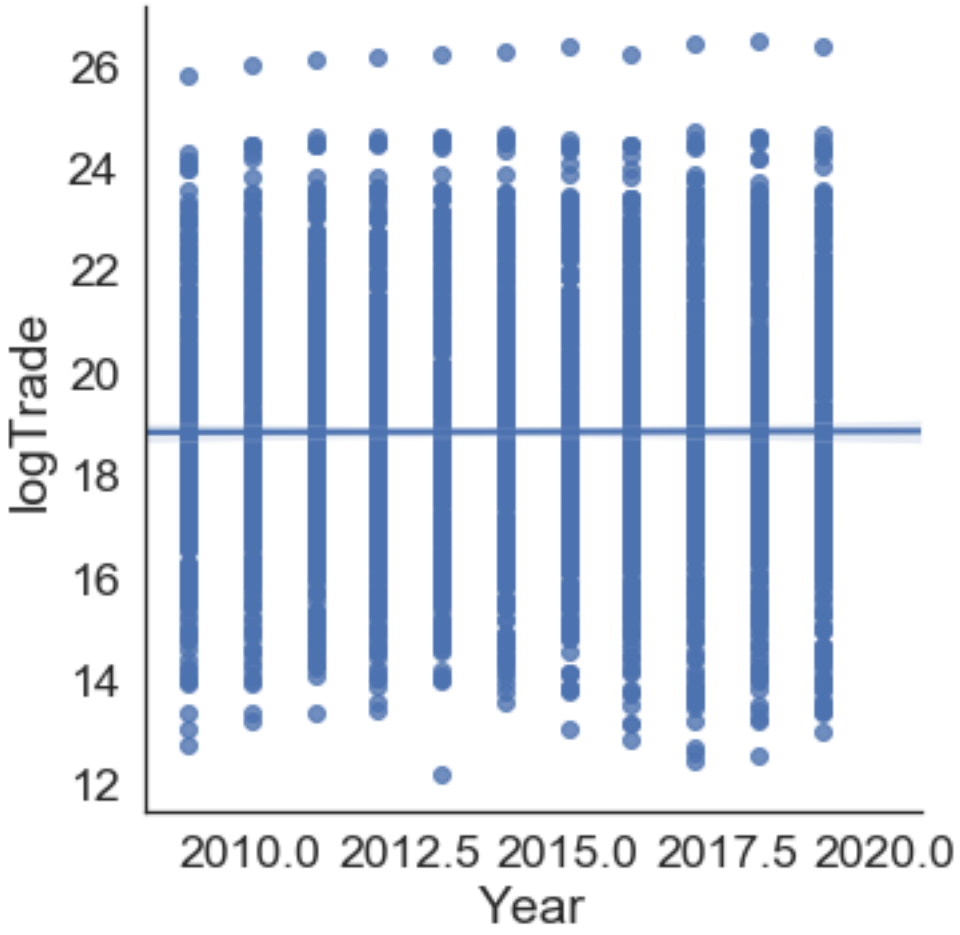


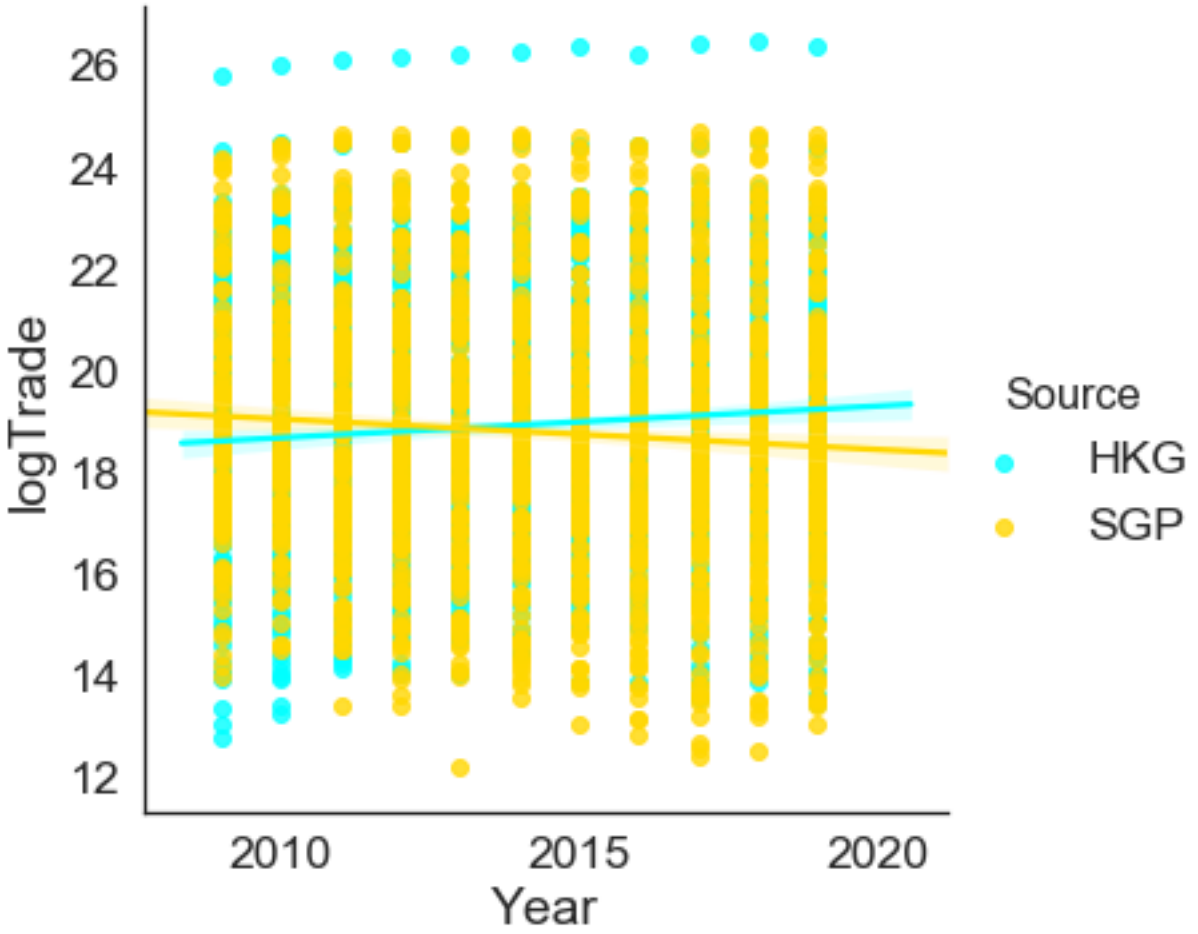
Differential Effects of Investment on Trade





Differential Trend in Trade Growth





Brief Reflections

- Data don't lie; data don't inform automatically.
- Algorithms are wonderful; algorithms need guidance.
- Reserach design matters; design determines what data tell us.
- While full network represents a forest, ego networks describe the leaves of each tree.
- There is much to be done in ego networks. Look forward to interdisciplinary collaboration.

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